tint appeared, which were from the first limited in their development to the male sex, there would not be the least difficulty in making a breed with the two sexes of a different colour, as, indeed, has been effected with a Belgian breed, in which the males alone are streaked with black."

The necessary assumption of the theory of sexual selection therefore is, not that spontaneous variations are always inherited unisexually, but that congenital variations occur and have occurred in certain species which from the first were limited in development to one sex. The selection or preservation of such variations does not explain their unisexual or other limitations. It might be suggested or maintained that spontaneous hereditary variations, limited to one sex, to one period of life, or to one season of the year, are liable to occur and have occurred in all species, but have been only selected and preserved in some. But I do not know that this is maintained by selectionists, and at any rate I know of no evidence to support such a contention.

The questions I have considered are, Why have such hereditary variations occurred in some species and not in others? Why are they so closely correlated with the functional activity of the testes, actually failing to develop normally in castrated animals? Why do they always, so far as we know, correspond to the special stimulations involved in the behaviour of the animals under sexual excitement?

Prof. Meldola asks, Why should my view be supposed to account for the limitation of the male characters to the male and the Darwinian view to fail? Surely it is obvious that Darwin's theory merely assumes that variations have occurred which from the first were limited in development as the characters are, while my theory is that they were so limited in development because they were due to stimulations similarly limited.

When Prof. Meldola suggests that the female has had any tendency to inherit the male characters eliminated by natural selection, he seems to me to be repeating an empty formula. There is no ground for supposing that any selection could eliminate such a tendency, and, further, it is an established fact that the tendency has not been eliminated; the female inherits the characters potentially, but in her they usually remain suppressed and latent to appear in actual development under certain conditions. J. T. CUNNINGHAM.

Penzance, December 29, 1900.

MR. CUNNINGHAM'S reply does not appear to me to shed any new light upon the subject of unisexual inheritance, and I can only adhere to the statement expressed in my review. Why he credits me with the supposition "that all spontaneous variations are inherited only by offspring of the same sex as the parents in which they occurred" is beyond my comprehension. There is nothing in my criticism of his views which warrants this, and I need hardly add that the facts which prove such a supposition to be erroneous are quite as familiar to me as they are to Mr. Cunningham. The real point at issue is a comparatively simple one. The author of the book insists that the theory of sexual selection fails to account for unisexual inheritance, and that his theory does account for this phenomenon. Again, it may be asked, why? The answer given above is simply a repetition of his opinion, as already published—the characters are so limited "*because they were due to stimulations similarly limited.*" That is to say, that in every case where the male possesses distinctive secondary sexual characters, these have been produced by direct stimulations acting on the male only, and are, therefore, limited by heredity to the male. Now Mr. Cunningham has just pointed out that transference of male characters to the female does take place, that blending of characters may, and does, occur, and that male characters may, under certain circumstances, appear in the female—a series of facts which we have all been familiar with ever since we became students of Darwin's writings. These facts are absolutely inexplicable on the "direct stimulation" theory. If the stimulations which produced a male character necessitate the restriction of that character to the male, then the only way of escaping from the dilemma in which the author has placed himself is to make one of two additional assumptions:—(1) The characters so blending are not secondary sexual characters, which would be simply resolving the question at issue into a verbal juggle; or (2) that in all cases where there is blending or transference, the same "stimulations" have acted upon both sexes. This last assumption is, however, opposed to the entire spirit of Mr. Cunningham's book, the whole burden of which is that there has been *dissimilarity* of "stimulation" between the sexes.

I should like to add, in concluding, that my own opinion as to the value of Mr. Cunningham's book is in no way shaken through my inability to accept his amended Lamarckism. Out of gratitude for the body of facts which he has collected, I will even go so far as to meet that much-hackneyed reproach of "repeating an empty formula" which anti-selectionists are so fond of using. For, after all, an empty formula, being (by definition) a formula containing no terms, is a negative kind of expression, and if it cannot, by virtue of its vacuity, do much to advance science, it cannot, on the other hand, do any harm. But a formula which contains erroneous terms may throw us off the track altogether, and my contention is that erroneous terms exist in Mr. Cunningham's formula. R. MELDOLA.

Direction of Spirals in Horns.

IN investigating the causes of directions of various spirals, I discovered a certain law and order in the arrangement of the direction of the spiral in horns which will interest many of your readers.

(1) That in the antelopes the right-hand spiral is on the left of the head, and the left-hand spiral on the right of the head (crossed). (2) That in sheep the right-hand spiral is on the right of the head, and the left spiral on the left side of the head (homonymous, or same name). The *wild* goats agree with the antelopes in regard to the spiral direction of their horns (crossed), and the oxen agree with the sheep in cases where the spiral can be noted (homonymous). Exceptions are not numerous and not difficult to remember, but this letter is not intended to do more than record the usual rules for spiral directions in horns.

If these observations be of value in clearness of description of a difficult point, it will be a gain; and they may also prove useful in classification. By taking a corkscrew (or a right-handed spiral) in the hand, it is easy to verify on the horns themselves the direction of their spiral curves. GEORGE WHERRY.

Cambridge.

Liquid Air.

THE notion that Virgil had an idea of "liquid air" because he speaks of "liquidus aer," is like the idea that Euripides was a smoker because a line of his may have begun

τὸ βακχικὸν δώρημα δός.

But there is a very curious anticipation of Prof. Dewar's discovery in Lucian's "Vera Historia" Book ii 89. Lucian there tells us that the inhabitants of the moon drink ἀὴρ ἀποθλιβόμενος ἐς κύλικα, "air squeezed or compressed into a goblet." I do not know whether liquid air has yet been used as a beverage, but in other respects the passage seems to be an exact description of the substance in question. J. ADAM.

Emmanuel College, Cambridge, December 30, 1900.

A Nest of Young Starlings in Winter.

WHILE a friend was walking through his fields near Broxbourne on Sunday afternoon, the 6th inst., he noticed a starling flying towards an an old elm with some food in its bill, and on going up to the tree he found a nest containing young birds. No doubt they are dead by this time, on account of the severe cold and the difficulty the old birds found in obtaining food for them. R. H. F.

January 8.

SOME ANIMALS EXTERMINATED DURING THE NINETEENTH CENTURY.

WHILE the century which has just closed may fairly lay claim to the gratitude of posterity on account of the magnificent tale of zoological work accomplished during its course, it is, on the other hand, undoubtedly open to the charge of having permitted the total extermination of not a few animals, and of having allowed the numbers of others to be so reduced that their disappearance, at least as truly wild creatures, can scarcely be delayed very many years longer. Possibly, if not probably, the sweeping away of the enormous herds of many species, like those of the American bison, may have been an inevitable accompaniment of the march of civilisation and progress; but there is no sort of excuse to be made for the fact that in certain instances naturalists failed to realise that species were on the very verge of extermination, and that they were actually allowed to disappear from the world without being adequately represented in our museums. Nor is it by any means certain that even the present generation is altogether free from reproach in this matter, although it cannot be said that any species hovering on the verge of extermination are absolutely unrepresented in collections. Whether, however, sufficient specimens of such species are being preserved for our successors may be an open question.

It is not our intention in this article to allude to the host of animals whose numbers have been reduced in such a wholesale manner during the century as to render them in more or less immediate danger of impending extermination, but to confine our attention in the main to those on whom this fate has already fallen. And here it may be mentioned with satisfaction that India enjoys a remarkably good record in this respect, for, so far as we are aware, it has not lost a single species of mammal, bird or reptile, either during the nineteenth century or within the period of definite history. It is true that the numbers and range of the Indian lion have been sadly curtailed during the last fifty years, and that if steps are not promptly taken for its protection that animal may, ere long, disappear from the Indian fauna. But, at any rate, it has not done so at present; and even were it exterminated in the country, this would not mean the extermination of a species, and possibly not even of a local race, since it is not improbable that the Persian representative of the lion (which is still abundant) may not be distinguishable from the Indian animal. Of large animals peculiar to India, perhaps the great Indian rhinoceros is the one that requires most careful watching in order that its numbers and its range may not be unduly reduced before it is too late to take adequate measures for its protection. And in this connection it is perhaps legitimate to call the attention of sportsmen and native princes to the urgent need of a fine specimen of this magnificent animal for the collection of the British Museum.

We have said that the century is responsible for the extinction of no inconsiderable number of the world's animals. But it must not for one moment be supposed that, within the historic period, no such exterminations by human agency had taken place in previous centuries. We have to go back so far as the year 1615 for the last evidence of the existence, in a living state, of the great flightless rail (*Aphanapteryx*) of Mauritius and Rodriguez; while the journal of the mate of the *Berkley Castle*, in 1681, is the last record of the dodo being seen alive. Again, the tall and flightless solitaire of Rodriguez is not definitely known to have been met with by Europeans after 1691, although there is some evidence to indicate that it may have lingered on in the more unfrequented portions of the island till as late as 1761. Of the extinct géant, or Mauritian coot (*Leguatia*), we have no evidence of its existence subsequent to 1695; while our last record of the crested parrot (*Lophopsittacus*) is as far back as 1601. Again, the great northern sea-cow (*Rhytina gigas*), which was only discovered on the islands of Bering Sea in the year 1741, had entirely ceased to exist by about 1767. Moreover, the giant tortoise of Réunion appears to have ceased to exist on its native island previous to the dawn of the nineteenth century, although at least one exported example has survived till our own day.

Neither can the nineteenth century be held responsible for the extermination of the South African blaauwbok (*Hippotragus leucophoeus*), a smaller relative of the familiar roan antelope, since the last known example is believed to have been killed in or about the year 1799. It had always a curiously restricted habitat, being confined to a small area in the Swellendam district.

On the other hand, the great auk is a bird whose loss we owe to the carelessness of the naturalists of the middle of the nineteenth century, for there is little doubt that if protective measures had been taken in time it might have been alive at the present day. From the American side of the Atlantic it probably disappeared somewhere about the year 1840; while the summer of 1844 witnessed the destruction of the last European pair of this remarkable bird, the last British representative having been hunted to death in the neighbourhood of Waterford Harbour ten years previously.

One of the most sad stories of extermination, and that, too, at a comparatively recent date, is revealed in the case of the South African quagga. According to Mr. H. A. Bryden, who has devoted a great deal of attention to the subject, the extermination of this zebra-like species in the Cape Colony took place between the years 1865 and 1870, and probably between the latter year and 1873 in the Orange River Colony, which was its last stronghold. The extermination of this species may be attributed entirely to the pernicious trade of hide-hunting, for in the first half of the century it was to be met with in thousands on the grass *veldt*, and formed the staple food of the Hottentot farm labourers of the Graaf Reinet and many other districts. What makes the matter still more melancholy is that specimens of the animal could easily have been procured in any numbers, both for our menageries and our museums, but that (probably owing to the circumstance that naturalists were ignorant of its impending fate) no steps were taken in the matter. In the year 1851 a female was purchased by the Zoological Society of London, while seven years later a male was presented to the same body by the late Sir George Grey. The latter survived till 1872, and was thus one of the last survivors of its race. Although the fact of the practical accomplishment of the extermination of the species at that time appears to have been unknown in London, the skin of Sir George Grey's specimen was luckily preserved, and may now be seen mounted (albeit in a somewhat worn and faded condition) in the British Museum as the solitary representative of the species. Fortunately the skeleton of this specimen was likewise preserved for the national collection.

Several photographs of the above-mentioned individual are in existence, and the Royal College of Surgeons possesses a small oil-painting, by Agassiz, of one of a pair of quaggas which were driven in harness by Mr. Sheriff Parkins in Hyde Park early in the nineteenth century. Of these two animals the College likewise possesses the skulls, which were acquired with the collection of Mr. Joshua Brookes on its purchase in 1828.

In addition to Sir George Grey's specimen, the British Museum formerly had the skin of a young quagga, in very bad condition, which was presented by the traveller William Burchell, and was subsequently described by Hamilton Smith as a distinct species, under the name of *Hippotigris isabellinus*. Apparently London museums possess no other relics of this lost species, of which, however, we believe there is an example in the museum at Edinburgh. As the animal yielded no trophies worthy the attention of the sportsman, it is unlikely that there are any specimens in private collections, unless, perchance, a skull or two may be in existence. The lack of other relics of such a common species affords a signal instance of lost opportunities, and should serve as a warning against our permitting a similar remissness to occur in the case of any other species threatened with extermination.

Mention has already been made of the extermination of the giant land tortoise of Réunion during the eighteenth century; and in the early part of its successor four other species became extinct in the neighbouring islands of the Mascarene group, namely, *Testudo indica*, *T. triserrata* and *T. inepta* in Mauritius, and *T. vosmaeri* in Rodriguez. It has likewise been considered probable that the thin-shelled tortoise (*T. abingdoni*), of Abingdon Island, in the Galapagos group, is also no longer existing, although it was certainly alive as recently as 1875.

Of birds that have disappeared during the century, in addition to the great auk, reference may first be made to the black emeu (*Dromaeus ater*), of Kangaroo Island, South Australia. When this island was explored in 1803 by a French expedition these birds were abundant, and three were sent home to Paris, where a pair lived till 1822. On their death, the skin of one and the skeleton of the other were mounted for exhibition in the Paris Museum, where they still remain. Of the third specimen no record was obtainable till 1900, when, as already noticed in this journal, its skeleton was discovered by Prof. Giglioli in the museum at Florence. These three priceless specimens are the only examples of a species which became extinct in the native state previous to the death of the Paris pair, and before it was even known to be different from the larger emeu of the mainland. For it appears that some years after the visit of the French expedition (to which Péron was naturalist) to Kangaroo Island, a settler squatted there and forthwith set to work to make a clean sweep of the emeus and kangaroos—a task in which he was only too successful.

Before the middle of the century another large bird appears to have made its final exit from this world. When Steller discovered the northern sea-cow in the islands of Bering Sea, he also brought to the notice of science a new species of cormorant (*Phalacrocorax perspicillatus*), which was especially interesting on account of being the largest representative of its kind, and likewise by the bare white rings round its eyes and the brilliant lustre of its green and purple plumage. Stupid and sluggish in disposition, Pallas's cormorant, as the species is commonly called, appears to have been last seen alive about the year 1839, when Captain Belcher, of H.M.S. *Sulphur*, was presented with a specimen by the Governor of Sitka, who also forwarded other examples to Petersburg. Captain Belcher's specimen is preserved in the British Museum, and three other skins are known to be in existence elsewhere.

The great white water-hen (*Notornis albus*), formerly inhabiting Lord Howe and Norfolk Islands, must be added to the defunct list. And the same is the case with the Tahiti rail (*Prosobonia leucoptera*) and Latham's white-winged sandpiper (*Hypotaenidia pacifica*), the latter of which in Captain Cook's time was abundant in the island above named, as well as in the neighbouring Eimeo. The New Zealand quail (*Coturnix novaezealandiae*) is likewise entered in the British Museum list as extinct. The beautiful "*Pigeon hollondais*," so-called from its plumage presenting the Dutch colours, and technically known as *Alectoroenas nitidissima*, is a Mauritian species whose extermination probably took place during the century. It is known solely by three examples, one of which is preserved at Port Louis, the second in Paris, and the third in Edinburgh.

Nor must we omit from our list two species of Kaka parrot, one of which (*Nestor productus*) was a native of Philip Island, while the home of the second (*N. norfolcensis*) was the neighbouring Norfolk Island. A species of parraquet (*Palaeornis exsul*), peculiar to the island of Rodriguez, is also believed to be exterminated.

Neither has the duck family escaped, for the well-known pied duck (*Camptolaemus labradorius*), an ally of the eider from the North Atlantic coast of America, appears in the defaulters' list, the last-known example having been killed in 1852.

Passing on to Passerine birds, a notable loss is the handsome crested pied starling, *Fregilupus varius*, which is believed to have become extinct about the middle of the century. Of the few remaining examples of this striking species one is preserved in the British Museum. Another species, exterminated within approximately the same period, is the gorgeous black and gold mamo, or sicklebill (*Drepanis pacifica*), of Hawaii, whence it was first brought to Europe by Captain Cook. As narrated in the "Birds of the Sandwich Islands," by Messrs. Scott Wilson and Evans, the extermination of this beautiful species is to be attributed to persecution for the sake of its yellow feathers, which were used for the cloaks of the native chiefs. About four specimens are known to be preserved in museums.

Of birds that have been locally exterminated, such as the burrowing petrel (*Œstrelata haesitata*), known in the Antilles as the diablotin, it is not our intention to speak on this occasion. And this article may accordingly be fitly brought to a close by an extract from Prof. A. Newton's "Dictionary of Birds," referring to two instances where species may have perished within the century without having ever come definitely under the notice of ornithologists. After stating that one Ledru accompanied an expedition dispatched by the French Government in 1796 to the West Indies, the Professor proceeds to observe that this explorer "gives a list of the birds he found in the islands of St. Thomas and St. Croix. He enumerates fourteen kinds of birds as having occurred to him then. Of these there is now no trace of eight of the number; and, if he is to be believed, it must be supposed that within fifty or sixty years of his having been assured of their existence they have become extinct. . . . If this be not enough we may cite the case of the French islands of Guadeloupe and Martinique, in which, according to M. Guyon, there were once found six species of Psittaci, all now exterminated; and it may possibly be that the macaws, stated by Gosse and Mr. March to have formerly frequented certain parts of Jamaica, but not apparently noticed there for many years, have fallen victims to colonisation and its consequences." R. L.

CLIMBING IN THE HIMALAYAS.[1]

DURING an extended cycling tour in the East, the authors spent the summer months of 1898 and the following year in the Himalayas. In the former season they penetrated from Srinagar, which they had reached on their vehicles, into the mountains of Ladakh, Nubra, and Suru, and, later on, into Sikkim from Darjeeling. Next year they took with them Matthias Zurbriggen, who had been guide to Sir Martin Conway on his memorable journey in 1892, retracing his steps up the Biafo Glacier to the Hispar Pass, and then making some important ascents in the district about the Skoro La Pass. Altogether they were encamped for many days at altitudes not less than 16,000 feet, crossed several passes more than a thousand feet higher, and made the ascent of three virgin icy summits, rising to heights of 18,600, 19,450, and 21,000 feet respectively. Thus Mrs. Workman not only is the first of her sex to do serious mountain work in the Himalayas, but also has been higher than any of them above sea-level.

Climbing in the Himalayas, as the authors remark, is a much more serious affair than in the Alps. The glaciers and peaks, as shown by the excellent illustrations, one of which is appended by the courtesy of the publisher, are certainly not less difficult; roads are often wanting, mountain inns and chalets always; the camp

---

[1] "In the Ice World of Himalaya, among the Peaks and Passes of Ladakh, Nubra, Suru, and Baltistan." By Fanny Bullock Workman and William Hunter Workman, M.A., M.D. With three maps and sixty-seven illustrations. Pp. xvi + 204. (London: T. Fisher Unwin, 1900.)